The Hong Kong University of Science and Technology

(tentative) Course Syllabus

Special Topics in Public Policy: (The Economics and Policy of Climate Change)

PPOL 6100V (3 credits)

Mondays, 13:30-16:20

Venue: Millennity

Instructor Name: Jeffrey Chow, PhD, Research Assistant Professor

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Course Description

Climate change is potentially the most challenging long-term issue that the global community will face in the 21st century. To date, policies and strategies to mitigate global climate change have been insufficient to dramatically lessen the expected damages. The impacts of climate change will amplify the effects of already existing stresses on degraded terrestrial and marine resources and exacerbate income and welfare inequality. At least in the early stages, these impacts will create winners and losers, redistributing crop production, perturbing the hydrological cycle, and altering ecosystem services, among other natural and social consequences. If climate change is allowed to proceed unchecked, in the long-term, the ranks of winners will dwindle as impacts increase in scope and severity.

Though anthropogenic climate change is a global problem, it is largely a result of fossil fuel emissions from the industrialized nations– emissions that have played a large role in establishing the current global distribution of wealth and power. Climate change will very likely reinforce this distribution. Thus, the dichotomy between relatively wealthy and relatively poor countries has emerged as one of the most divisive issues in the climate policy arena, leading to extremely difficult questions of global concern, such as:

- Who has the right to utilize and benefit from the Earth's atmospheric commons?
- How do we quantify the impacts of climate change and for whom?
- How do we formulate the appropriate responses?
- Who is (or should be) liable for climate-related damages?
- Should developing nations expected to curb their emissions? To what extent and on what time scale? Who should pay the incremental costs?
- What steps do cities need to take to respond to climate change?
- How can the vulnerable states and communities adapt to climate change?

The climate issue is inherently interdisciplinary. My main goal is to challenge students to think across disciplinary boundaries. We will discuss a range of theories and methodologies, some of which may be unfamiliar to some students due to the variety of their educational backgrounds. Although the main methodological approach will be grounded in economic theory, my intent is for students to gain a degree of comfort with different analytical methods in order to question the assumptions, and debate, critique, or

justify the use of different methodologies in addressing particular aspects of problems relating to scientific, policy, and social dimensions of the broad climate issue.

Specifically, by the end of the course, students shall:

1. Be familiarized with current, pertinent issues in climate change policy;
2. Be equipped with commonly applied analytical tools for evaluating policy;
3. Have improved their research and presentation skills for communicating about climate policy;
4. Be familiarized with and capable of critiquing a wide scope of policies and programs for addressing climate change.

Instructional approach

I believe strongly in adaptation and flexibility in the classroom, particularly in the context of a graduate course. Many students already have expertise or experience in certain topics that we will cover and their input will be valuable and explicitly utilized in the classroom. Students will be strongly encouraged to question, probe, respectfully interject, and otherwise participate in class during lectures, discussions, and seminars.

Each 170-minute session of this course is roughly split into three sections, comprised of three 50-55 minute sections separated by 5-10 minute breaks, depending on time availability. The first section is comprised of a course lecture, usually centered on foundational knowledge or theory. The second section is generally devoted to a technical session to impart analytical skills relevant to the foundational section. The third section is a student-led seminar, in which a student (or team of students, depending on final enrolment) will give professional-level oral presentations concerning a specific government/multilateral project or policy of their choosing that explicitly addresses climate change (mitigation, adaptation, resilience, loss and damage, etc.) and the other students ask questions of the presenters and critique the project or policy based on the knowledge and tools drawn from lecture. Essentially, in addition to the foundational and technical material imparted during lectures, students have an opportunity to draw upon their own experience and knowledge to contribute to the education of their peers on a weekly basis. Students also have multiple opportunities to practice their professional analytical, presentation, and communication skills. Each student or student team presents at least twice over the course of the semester, with one presentation about a climate project from their home country and another about one from outside their home country.

The breakdown of each session into three sections also affords more opportunities for classes co-lectured by guest scholars who are experts in various key aspects of the extremely multifaceted climate issue, colleagues with whom I have collaborated in the past. To supplement my own expertise in forests and land use, we may bring in interdisciplinary experts in, for example, cities' response to climate change, natural disasters related to climate change, rural adaptation, and food security.

Intended Learning Outcomes (ILOs)

By the end of the course, students shall:

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2. Be equipped with commonly applied analytical tools for evaluating policy;
3. Have improved their research and presentation skills for communicating about climate policy;
4. Be familiarized with and capable of critiquing a wide scope of policies and programs for addressing climate change.

Assessment and Grading

Grade distribution will be based on rankings from final total scores. The distribution will be:

A: 25-35%; B: 65-75%; C+F: 0-10%

Assessments:

Seminar presentations and questions (i.e., participation) 40%
Students are expected to give a 15 to 20-minute oral presentation at least twice during the semester on a government/multilateral climate change policy or project of their choice and prepare presentation slides with citations and references. Students not presenting in a given week are expected to prepare at least four questions for the presenters. Both presentation slides (15% each) and questions (10%) must be submitted the instructor to prior to the start of the session. Presentation slides must be submitted to canvas and/or the TA by the FRIDAY before the Monday of the presentation. Questions must be submitted to canvas and/or the TA BEFORE the start of class for the week.

Take-home midterm exam 30%
Students will be assigned a take-home midterm exam at the end of the 7th session. The exam will cover all materials presented up through the 7th session, including the theory, technical, and seminar sections *as well as required readings*. Students may work together and use any course materials at their disposal to complete the exam. However, students MAY NOT submit identical exam answers and must disclose the names of all students that they consulted with while completing the exam. Graders will use anti-plagiarism and anti-AI software to verify that responses are original. The exam is due **before** the start of the XX session. A grading curve is based on the top score = 100%.

Final exam 30%
Students have an in-person final exam on the assigned final exam session. The final exam will be comprehensive and cover all materials in the theory, technical, seminar sections, and required readings. Students may prepare A grading curve is based on the top score = 100%.

Assessment Task	Contribution to Overall Course grade (%)	Due date
Mid-Term exam	30%	TBD
Presentations	30%	variable
Discussion Questions	10%	Each week before class
Final examination	30%	In-person on university-assigned date

Assessment marks for individual assessed tasks will be released within two weeks of the due date.

Final Grade Descriptors:

Grades	Short Description	Elaboration on subject grading description
A	Excellent Performance	Demonstrates a comprehensive grasp of subject matter, expertise in problem-solving, and significant creativity in thinking. Exhibits a high capacity for scholarship and collaboration, going beyond core requirements to achieve learning goals.
B	Good Performance	Shows good knowledge and understanding of the main subject matter, competence in problem-solving, and the ability to analyze and evaluate issues. Displays high motivation to learn and the ability to work effectively with others.
C	Satisfactory Performance	Possesses adequate knowledge of core subject matter, competence in dealing with familiar problems, and some capacity

		for analysis and critical thinking. Shows persistence and effort to achieve broadly defined learning goals.
D	Marginal Pass	Has threshold knowledge of core subject matter, potential to achieve key professional skills, and the ability to make basic judgments. Benefits from the course and has the potential to develop in the discipline.
F	Fail	Demonstrates insufficient understanding of the subject matter and lacks the necessary problem-solving skills. Shows limited ability to think critically or analytically and exhibits minimal effort towards achieving learning goals. Does not meet the threshold requirements for professional practice or development in the discipline.

Course AI Policy

AI tools may not be used in this course for the completion of graded tasks.

Communication and Feedback

Assessment marks for individual assessed tasks will be communicated via Canvas within two weeks of submission. Feedback on assignments will include [specific details, e.g., strengths, areas for improvement]. Students who have further questions about the feedback including marks should consult the instructor within five working days after the feedback is received.

Resubmission Policy

Because assignments are specifically scheduled, resubmissions will not be permitted.

Required Texts and Materials

Nordhaus W. 2013. *The Climate Casino: Risk, Uncertainty, and Economics for a Warming World*. Yale University Press. Available on Amazon.

Seo N (ed). 2022. *Handbook of Behavioral Economics and Climate Change*. Edward Elgar. Will be made available on Canvas

Other readings listed below course outline.

Academic Integrity

Students are expected to adhere to the university's academic integrity policy. Students are expected to uphold HKUST's Academic Honor Code and to maintain the highest standards of academic integrity. The University has zero tolerance of academic misconduct. Please refer to Academic Integrity | HKUST – Academic Registry for the University's definition of plagiarism and ways to avoid cheating and plagiarism.

Course outline (tentative)

Date	Topic	Activity	Readings

1 Sep	Course overview Key concepts in climate change policy: mitigation, adaptation, resilience, loss and damage Leakage, permanence, additionality, verification	Environmental economics review (externalities, public goods) Concepts of policy analysis SWOT analysis	Required: Nordhaus, 2013, Ch. 1-2 Seo, 2022, Ch. 1 Optional: Kaul, 1999 Sandler, 1999
8 Sep	Review of climate science and impacts The economic origins of climate change, expected trajectories, and tipping points Risk and uncertainty, non-linearities	Time discount rate and intergenerational equity Example case study seminars (TA)	Required: Nordhaus, 2013, Ch. 3-5, 16 Optional: IPCC, 2023
15 Sep	Multilateral climate policy and review of the negotiations process to date	Modeling greenhouse gases as stock pollutants Social cost of carbon Student-led case study seminars	Required: Nordhaus, 2013, Ch. 17 Farzin, 1996 Optional: Naser and Pearce, 2022
22 Sep	Climate damages developing countries	Ricardian damage estimation Student-led case study seminars	Required: Nordhaus, 2013, Ch. 6-8 Optional: Seo et al. 2005. Seo 2022, Ch. 4
29 Sep	Climate damages advanced temperate countries	Integrated assessment and general equilibrium modelling Student-led case study seminars	Required: Nordhaus, 2013, Ch. 9-12 Optional: Nordhaus, 1993 Nordhaus, 2018
6 Oct	Mitigation: energy and transportation systems Alternative energy Industrial carbon sequestration Additionality and permanence	Stabilization wedges The “duck” curve Student-led case study seminars	Required: Nordhaus, 2013, Ch. 14-15, 22-23 Optional: Lazar, 2016 Ellaban et al., 2014 Jiang et al., 2019
13 Oct	Mitigation: agriculture and land use change REDD+	Carbon accounting in forest resources and wood products Mid-term review and Q&A Student-led case study seminars	Required: IPCC, 2019 Angelsen and Wertz-Kanounnikoff, 2008 Optional: Duchelle et al., 2018

20 Oct	Mitigation: the economics and policy of carbon Carbon pricing Carbon markets and trading	Tax distortions and double dividends Student-led case study seminars	Required: Nordhaus, 2013, Ch. 18-20 Optional: Bovenberg and Goulder, 1996 Nerudova and Dobranschi, 2014
27 Oct	Adaptation and resilience natural disasters	Ecosystem services assessment Student-led case study seminars	Required: Nordhaus, 2013, Ch. 13 Seo, 2022, Ch. 2-3 Optional: Bagstad et al., 2014. Chow, 2018
3 Nov	Adaptation and resilience food and other production systems human health (TA)	Cost benefit analysis Student-led case study seminars	Required: Seo, 2022, Ch. 7 Cheng and Berry, 2013 Optional: Chow, 2015
10 Nov	Defining vulnerability Loss and damage compensation	Vulnerability indices Risk and uncertainty analysis Student-led case study seminars	Required: Bakkensen et al., 2017 Addison et al., 2022 Optional: Yohe, 2022
17 Nov	International policies, revisited Climate politics Critics of climate science Obstacles to policy	Equity analysis Student-led case study seminars	Required: Nordhaus, 2013, Ch. 21, 24-26 Optional:
24 Nov	TBD	TBD	TBD

Readings

Addison S, Bharadwaj R, Carthy A, Gallagher C, More C, Nisi N, Shakya C. 2022. *Addressing loss and damage: Practical insights for tackling multidimensional risks in LDCs and SIDS*. IIED working paper.

Angelsen A, Wertz-Kanounnikoff S. 2008. What are the key design issues for REDD and the criteria for assessing options. *Moving ahead with REDD: issues, options and implications*, 11.

Bagstad KJ, Villa F, Batker D, Harrison-Cox J, Voigt B, Johnson GW. 2014. From theoretical to actual ecosystem services: mapping beneficiaries and spatial flows in ecosystem service assessments. *Ecology and Society* 19(2): 64

Bakkensen LA, Fox-Lent C, Read LK, Linkov I. 2017. Validating resilience and vulnerability indices in the context of natural disasters. *Risk Analysis*37(5): 982-1003.

Bovenberg AL, Goulder LH. 1996. Optimal environmental taxation in the presence of other taxes: general-equilibrium analyses. *The American Economic Review* 86(4): 985-1000.

Cheng JJ, Berry P. 2013. Health co-benefits and risks of public health adaptation strategies to climate change: a review of current literature. *International Journal of Public Health* 58: 305-311.

Chow J. 2015. Spatially explicit evaluation of local extractive benefits from mangrove plantations in Bangladesh. *Journal of Sustainable Forestry* 34(6-7): 651-681.

Chow J. 2018. Mangrove management for climate change adaptation and sustainable development in coastal zones. *Journal of Sustainable Forestry* 37(2) 13:9-156.

Ellabban O, Abu-Rub H, Blaabjerg F. 2014. Renewable energy resources: current status, future prospects and their enabling technology. *Renewable and Sustainable Energy Reviews* 39: 748-764.

Farzin YH. 1996. Optimal pricing of environmental and natural resource use with stock externalities. *Journal of Public Economics* 62: 31-57.

IPCC. 2019. Summary for Policymakers. In: *Climate Change and Land: an IPCC special report on climate change, desertification, land degradation, sustainable land management, food security, and greenhouse gas fluxes in terrestrial ecosystems*. https://doi.org/10.1017/9781009157988.001

IPCC. 2023. *Synthesis Report for Policymakers*.

Jiang X, Ge M, Orvis R, Rissman J, Iu L, Henning R. 2019. *Technical Note: Hong Kong Energy Policy Simulator: Methods, Data, and Scenario Results for 2050*. World Resources Institute and Civic Exchange. 31pp.

Kaul I, Grunberg I, Stern MA. 1999. Defining Global Public Goods. Chapter 2 in: Kaul I, et al. (eds.). *Global Public Goods: International Cooperation in the 21st Century*. Oxford University Press. 2-19.

Lazar J. 2016. *Teaching the "Duck" to Fly, Second Edition*. The Regulatory Assistance Project, Montpelier, VT. http://www.raponline.org/document/download/id/7956

Naser MM, Pearce P. 2022. Evolution of the International Climate Change Policy and Processes: UNFCCC to Paris Agreement. In *Oxford Research Encyclopedia of Environmental Science*.

Nerudova D, Dobranschi M. 2014. Double dividend hypothesis: can it occur when tackling carbon emissions? *Procedia Economics and Finance*12: 472-479.

Nordhaus WD. 1993. Optimal greenhouse-gas reductions and tax policy in the "DICE" model. *The American Economic Review* 83(2): 313-317.

Nordhaus WD. 2018. Evolution of modeling of the economics of global warming: changes in the DICE model, 1992-2017. *Climatic Change* 148: 623-640.

Sandler T. 1999. Intergenerational public goods: strategies, efficiency and solutions. Chapter 3 in: Kaul I, et al. (eds.). *Global Public Goods: International Cooperation in the 21st Century*. Oxford University Press. 20-50.

Seo SN, Mendelsohn R, Munasinghe M. 2005. Climate change and agriculture in Sri Lanka: a Ricardian analysis. *Environment and Development Economics* 10: 581-596.

Yohe G. 2022. How to Think About Climate Change Responses: On Organizing One's Thoughts. In *Handbook of Climate Change Mitigation and Adaptation* (pp. 163-224). Cham: Springer International Publishing.